

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
31 March 2005 (31.03.2005)

PCT

(10) International Publication Number
WO 2005/029015 A2

(51) International Patent Classification⁷: **G01J**
(21) International Application Number:
PCT/US2004/015046
(22) International Filing Date: 13 May 2004 (13.05.2004)
(25) Filing Language: English
(26) Publication Language: English
(30) Priority Data:
60/482,386 25 June 2003 (25.06.2003) US

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(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,
GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,
KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,
MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG,
PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM,
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM,
ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,
FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI,
SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, ML, MR, NE, SN, TD, TG).

Published:

— without international search report and to be republished
upon receipt of that report

For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.

(54) Title: MULTISPECTRAL, MULTIFUSION, LASER-POLARIMETRIC OPTICAL IMAGING SYSTEM

(57) Abstract: A multi-energy polarization imaging method consisting of a multi-fusion, dual-rotating retarder / multiple-energy complete Mueller matrix-based polarimeter and dual-energy capabilities, has been invented. The term multifusion describes the use of several imaging functions altogether such as polarimetric imaging, dual-energy subtraction, multifocal imaging and other. By subtracting polarimetric parameters such as degree of polarization, degree of linear polarization, degree of circular polarization, respectively, obtained with interrogation light beams of wavelengths λ_1 and λ_2 , the system, enhanced imaging is obtained. The system includes a light source for illuminating a target with a first quantity of light having a first wavelength and a second quantity of light having a second wavelength, the first and second wavelengths being different. A polarization-state generator generates a polarization state for each of the first and second quantities of light, and includes a first polarizer through which the first and second quantities of light are transmitted before entering a first waveplate. A polarization-state receiver evaluates a resulting polarization state of the first and second quantities of light following illumination of the target, the polarization-state receiver including a second waveplate through which the first and second quantities of light are transmitted before entering a second polarizer. An optical image-capture device captures a first image of the target illuminated by the first quantity of light and a second image of the target illuminated by the second quantity of light. A processing unit assigns a weighting factor to at least one of the first and second images and evaluates a weighted difference between the first and second images to generate a multi-energy image of the target.

WO 2005/029015 A2

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(43) International Publication Date
31 March 2005 (31.03.2005)

PCT

(10) International Publication Number
WO 2005/029015 A3

(51) International Patent Classification⁷: **G01J 4/00**

(21) International Application Number:
PCT/US2004/015046

(22) International Filing Date: 13 May 2004 (13.05.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
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Published:

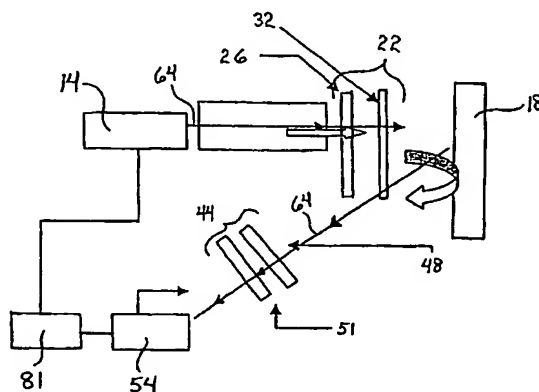
- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(88) Date of publication of the international search report:
18 August 2005

(15) Information about Correction:

[Continued on next page]

(54) Title: **MULTISPECTRAL, MULTIFUSION, LASER-POLARIMETRIC OPTICAL IMAGING SYSTEM**



(57) Abstract: A multi-energy polarization imaging method consisting of a multi-fusion, dual-rotating retarder / multiple-energy complete Mueller matrix-based polarimeter and dual-energy capabilities. The system includes a light source (14) for illuminating a target (18) with a first quantity of light having a first wavelength and a second quantity of light having a second wavelength, the first and second wavelength being different. A polarization-state generator (22) generates a polarization state for each of the first and second quantities of light, and includes a first polarizer (26) through which the first and second quantities of light are transmitted before entering a first waveplate (32). A polarization-state receiver (44) evaluates a resulting polarization state of the first and second quantities of light following illumination of the target (18), the polarization-state receiver (44) including a second optical image-capture device captures a first image of the target illuminated by the first quantity of light and a second image of the target illuminated by the second quantity of light. A processing unit assigns a weighting factor to at least one of the first and second images and evaluates a weighted difference between the first and second images to generate a multi-energy image of the target (18).

WO 2005/029015 A3



Previous Correction:

see PCT Gazette No. 20/2005 of 19 May 2005, Section II

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